



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

() Preliminary Specification

(V) Final Specification

Module	21.5" Color TFT-LCD
Model Name	M215HTN01.0

Customer	Date
_____	_____
Approved by	
_____	_____
Note: This Specification is subject to change without notice.	

Approved by	Date
<u>Howard Lee</u>	<u>2012/10/15</u>
Prepared by	
<u>Vincent Chan</u>	<u>2012/10/15</u>
AU Optronics Corporation	



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

Content

1 HANDLING PRECAUTIONS	6
2 GENERAL DESCRIPTION.....	7
2.1 Display Characteristics	7
2.2 Optical Characteristics.....	8
3 FUNCTIONAL BLOCK DIAGRAM.....	12
4 ABSOLUTE MAXIMUM RATINGS.....	13
4.1 TFT LCD Module	13
4.2 Backlight Unit	13
4.3 Absolute Ratings of Environment	13
5 ELECTRICAL CHARACTERISTICS.....	15
5.1 TFT LCD Module	15
5.1.1 Power Specification	15
5.1.2 Signal Electrical Characteristics	16
5.2 Backlight Unit	18
6 SIGNAL CHARACTERISTICS	19
6.1 Pixel Format Definition	19
6.2 Input Data Format Definition	19
6.3 Signal Description.....	20
6.4 Timing Characteristics.....	22
6.5 Timing Diagram.....	23
6.6 Power ON/OFF Sequence.....	24
7 CONNECTOR AND PIN ASSIGNMENT.....	25
7.1 TFT LCD Module	25
7.1.1 Pin Assignment.....	25
7.2 LED Connector on Backlight Unit	26
7.2.1 LED Pin assignment.....	26
7.2.2 LED Connector Dimension	27
7.2.3 LED Mating housing dimension.....	27
8 RELIABILITY TEST.....	28
9 SHIPPING LABEL	30
10 MECHANICAL CHARACTERISTICS.....	錯誤! 尚未定義書籤。
11 PACKING SPECIFICATION	錯誤! 尚未定義書籤。
11.1 Packing Flow.....	錯誤! 尚未定義書籤。
11.2 Pallet and Shipment Information	錯誤! 尚未定義書籤。



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

Records of Revision

Version and Date	Page	Old description	New Description	Remark
0.1 2011/12/07	All	First Edition for Customer		
0.2 2012/1/9	7		Add Response Time / Gray to Gray(16x16 avg.)	
0.2 2012/1/9	7		Correct Color / Chromaticity Coordinates (CIE)	
0.2 2012/1/9	12	Backligh Unit / CCFL Current	Backlight Unit / LED Forward Current , LED Pulse Forward Current , LED forward Voltage variation (per string variation)	
0.2 2012/1/9	12		Add Note 5: IRLED1,2,3,4 and IPLED1,2,3,4 define as per strings LED current.	
0.2 2012/1/9	17	Symbol / IRLED	Symbol / IRLED1, IRLED2, IRLED3, IRLED4	
0.2 2012/1/9	17	PBLU / Typ 9.216 , Max 10.886	PBLU / Typ 9.2 , Max 10.9	
0.2 2012/1/9	17		Correct Note 1,2,3,4	
0.2 2012/1/9	28	9.0 Shipping Label / Model No:M215HTN01 V0	9.0 Shipping Label / Model No:M215HTN01.0	
1.0 2012/04/18	2		Add 5.2 Backlight Unit item Add 7.2.2 LED Connector Dimension Add 7.2.3 LED Mating housing dimension Add 11.1 Packing Flow Add 11.2 Pallet and Shipment Information	
1.0 2012/04/18	6	Power Consumption / 14.2(Typ.) (without inverter ; 60 Hz, all black pattern)	Power Consumption(VDD line + LED line) / 13.3W VDD line : PDD (typ), All black pattern at 60Hz = 4.1W LED line : PBLU (typ) = 9.2W	
1.0 2012/04/18	6		Delete TCO Compliance item	
1.0 2012/04/18	9		Add Note 4 Algorithm: Gray Level A – Gray Level B ≥ 16 , then the average gray to gray response time is 2 ms, (F= 60 Hz).	
1.0 2012/04/18	11		Correct Functional Block Diagram	
1.1	11	I/F PCB Interface: FI-XB30SRL-HF11 (JAE)	I/F PCB Interface: FI-XPB30SRLA-HF11 (JAE)	



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

2012/07/20		or 093F30-B0T01A (Starconn)	01-187121-30091-3(A) (P-TWO)	
1.1 2012/07/20	24	7.1 TFT LCD Module Manufacturer / JAE, Starconn Type Part Number / FI-XB30SRL-HF11(JAE) 093F30-B0T01A(Starconn)	7.1 TFT LCD Module Manufacturer / JAE P-TWO Type Part Number / FI-XPB30SRLA-HF11 01-187121-30091-3(A)	
1.1 2012/07/20	20		Correct Signal Description / Note1	
1.1 2012/07/20	23		Correct Power ON/OFF Sequence	
1.1 2012/07/20	25		Correct 7.2.1 LED Pin assignment / Signal Name Add LED light bar connector illustration	
1.1 2012/07/20	26		Add 7.2.2 LED Connector Dimension Add 7.2.3 LED Mating housing dimension	
1.1 2012/07/20	27	8.0 Reliability Test/Drop Test/ Height: 60 cm, package test	8.0 Reliability Test/Drop Test/ Height: 46 cm, package test	
1.1 2012/07/20	27	ESD (Electro Static Discharge) / Contact Discharge: $\pm 8KV$, 150pF(330 Ω) 1sec, 8 points, 25 times/ point. Air Discharge: $\pm 15KV$, 150pF(330 Ω) 1sec 8 points, 25 times/ point.	ESD (Electro Static Discharge) / Contact Discharge: $\pm 15KV$, 150pF(330 Ω) 1sec, 11 points, 25 times/ point. Air Discharge: $\pm 15KV$, 150pF(330 Ω) 1sec 11 points, 25 times/ point.	
1.1 2012/07/20	27	Altitude Test / Operation:10,000 ft Non-Operation:30,000 ft	Altitude Test /Operation: 18,000 ft Non-Operation: 40,000 ft	
1.1 2012/07/20	29		10.0 Mechanical Characteristics / Add Torque value & section illustration	
1.2 2012/10/15	11	I/F PCB Interface: FI-XPB30SRLA-HF11 (JAE) 01-187121-30091-3(A) (P-TWO)	I/F PCB Interface: FI-XPB30SRLA-HF11 (JAE) 01-187145-30091-3(A) (P-TWO)	
	24	Type port number : FI-XPB30SRLA-HF11 01-187121-30091-3(A)	Type port number : FI-XPB30SRLA-HF11 01-187145-30091-3(A)	
	6	Power Consumption : 13.3W VDD line : PDD (typ), All black pattern at 60Hz = 4.1W LED line : PBLU (typ) = 9.2W	Power Consumption : 13.6W VDD line : PDD (typ), All black pattern at 60Hz = 4.1W LED line : PBLU (typ) = 9.5W	



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

17	5.2 Backlight Unit: Parameter guideline for LED driving is under stable conditions at 25 °C (Room Temperature): <table border="1"> <thead> <tr> <th>Symbol</th><th>Description</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Unit</th><th>Note</th></tr> </thead> <tbody> <tr> <td>ILED1~ ILED2~ ILED3~ ILED4~</td><td>LED Operation Current</td><td>-</td><td>60</td><td>63</td><td>[mA]</td><td>Note 1</td></tr> <tr> <td>VLE</td><td>Light Bar Operation Voltage - (for reference)</td><td>36</td><td>38.4</td><td>43.2</td><td>[Vdc]</td><td>Note 2</td></tr> <tr> <td>PBLU</td><td>BLU Power Consumption (for reference)</td><td>-</td><td>9.2</td><td>10.9</td><td>[Watt]</td><td>Note 3</td></tr> <tr> <td>LTLED</td><td>LED Life Time (Typical)</td><td>30,000</td><td>-</td><td>-</td><td>[Hour]</td><td>Note 4</td></tr> </tbody> </table>	Symbol	Description	Min.	Typ.	Max.	Unit	Note	ILED1~ ILED2~ ILED3~ ILED4~	LED Operation Current	-	60	63	[mA]	Note 1	VLE	Light Bar Operation Voltage - (for reference)	36	38.4	43.2	[Vdc]	Note 2	PBLU	BLU Power Consumption (for reference)	-	9.2	10.9	[Watt]	Note 3	LTLED	LED Life Time (Typical)	30,000	-	-	[Hour]	Note 4	5.2 Backlight Unit: Parameter guideline for LED driving is under stable conditions at 25 °C (Room Temperature): <table border="1"> <thead> <tr> <th>Symbol</th><th>Description</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Unit</th><th>Note</th></tr> </thead> <tbody> <tr> <td>ILED1~ ILED2~ ILED3~ ILED4~</td><td>LED Forward Current</td><td>-</td><td>60</td><td>63</td><td>[mA]</td><td>Note 1</td></tr> <tr> <td>VLED</td><td>Light Bar Operation Voltage - (for reference)</td><td>34.5</td><td>39.6</td><td>43.2</td><td>[Vdc]</td><td>Note 2</td></tr> <tr> <td>PBLU</td><td>BLU Power Consumption (for reference)</td><td>8.28</td><td>9.5</td><td>10.9</td><td>[Watt]</td><td>Note 3</td></tr> <tr> <td>LTLED</td><td>LED Life Time (Typical)</td><td>30,000</td><td>-</td><td>-</td><td>[Hour]</td><td>Note 4</td></tr> </tbody> </table>	Symbol	Description	Min.	Typ.	Max.	Unit	Note	ILED1~ ILED2~ ILED3~ ILED4~	LED Forward Current	-	60	63	[mA]	Note 1	VLED	Light Bar Operation Voltage - (for reference)	34.5	39.6	43.2	[Vdc]	Note 2	PBLU	BLU Power Consumption (for reference)	8.28	9.5	10.9	[Watt]	Note 3	LTLED	LED Life Time (Typical)	30,000	-	-	[Hour]	Note 4
Symbol	Description	Min.	Typ.	Max.	Unit	Note																																																																		
ILED1~ ILED2~ ILED3~ ILED4~	LED Operation Current	-	60	63	[mA]	Note 1																																																																		
VLE	Light Bar Operation Voltage - (for reference)	36	38.4	43.2	[Vdc]	Note 2																																																																		
PBLU	BLU Power Consumption (for reference)	-	9.2	10.9	[Watt]	Note 3																																																																		
LTLED	LED Life Time (Typical)	30,000	-	-	[Hour]	Note 4																																																																		
Symbol	Description	Min.	Typ.	Max.	Unit	Note																																																																		
ILED1~ ILED2~ ILED3~ ILED4~	LED Forward Current	-	60	63	[mA]	Note 1																																																																		
VLED	Light Bar Operation Voltage - (for reference)	34.5	39.6	43.2	[Vdc]	Note 2																																																																		
PBLU	BLU Power Consumption (for reference)	8.28	9.5	10.9	[Watt]	Note 3																																																																		
LTLED	LED Life Time (Typical)	30,000	-	-	[Hour]	Note 4																																																																		

25	7.2 LED Connector on Backlight Unit: This connector is mounted on LED light bar. <table border="1"> <thead> <tr> <th>Connector Name / Designation</th><th>Light Bar Connector</th></tr> </thead> <tbody> <tr> <td>Manufacturer</td><td>CVILUX</td></tr> <tr> <td>Type/Part Number</td><td>C11406/11 HRB-NH</td></tr> <tr> <td>Mating Housing Part Number</td><td>-</td></tr> </tbody> </table>	Connector Name / Designation	Light Bar Connector	Manufacturer	CVILUX	Type/Part Number	C11406/11 HRB-NH	Mating Housing Part Number	-	7.2 LED Connector on Backlight Unit: This connector is mounted on LED light bar. <table border="1"> <thead> <tr> <th>Connector Name / Designation</th><th>Light Bar Connector</th></tr> </thead> <tbody> <tr> <td>Manufacturer</td><td>CVILUX</td></tr> <tr> <td>Type/Part Number</td><td>C11406/11 HRB-NH</td></tr> <tr> <td>Mating Housing Part Number</td><td>-</td></tr> </tbody> </table>	Connector Name / Designation	Light Bar Connector	Manufacturer	CVILUX	Type/Part Number	C11406/11 HRB-NH	Mating Housing Part Number	-
Connector Name / Designation	Light Bar Connector																	
Manufacturer	CVILUX																	
Type/Part Number	C11406/11 HRB-NH																	
Mating Housing Part Number	-																	
Connector Name / Designation	Light Bar Connector																	
Manufacturer	CVILUX																	
Type/Part Number	C11406/11 HRB-NH																	
Mating Housing Part Number	-																	

21	6.4 Timing Characteristics: The input signal timing specifications are shown as the following table: <table border="1"> <thead> <tr> <th>Signal</th><th>Item</th><th>Symbol</th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr> </thead> <tbody> <tr> <td rowspan="3">Vertical Section</td><td>Period</td><td>T_v</td><td>1080</td><td>1120</td><td>2047</td><td>1h</td></tr> <tr> <td>Active</td><td>T_{disp(v)}</td><td>1080</td><td>1080</td><td>1080</td><td>1h</td></tr> <tr> <td>Blanking</td><td>T_{bp(v)}+T_{fp(v)}+FW_{vs}</td><td>8</td><td>40</td><td>967</td><td>1h</td></tr> <tr> <td rowspan="3">Horizontal Section</td><td>Period</td><td>T_h</td><td>1034</td><td>1060</td><td>2047</td><td>1clk</td></tr> <tr> <td>Active</td><td>T_{disp(h)}</td><td>960</td><td>960</td><td>960</td><td>1clk</td></tr> <tr> <td>Blanking</td><td>T_{bp(h)}+T_{fp(h)}+FW_{hs}</td><td>74</td><td>100</td><td>1087</td><td>1clk</td></tr> <tr> <td rowspan="2">Clock</td><td>Period</td><td>T_{clk}</td><td>25</td><td>13.3</td><td>11.1</td><td>ns</td></tr> <tr> <td>Frequency</td><td>F_{req}</td><td>40</td><td>75</td><td>94</td><td>MHz</td></tr> <tr> <td>Frame rate</td><td>Frame rate</td><td>F_r</td><td>50</td><td>60</td><td>75</td><td>Hz</td></tr> </tbody> </table>	Signal	Item	Symbol	Min	Typ	Max	Unit	Vertical Section	Period	T _v	1080	1120	2047	1h	Active	T _{disp(v)}	1080	1080	1080	1h	Blanking	T _{bp(v)} +T _{fp(v)} +FW _{vs}	8	40	967	1h	Horizontal Section	Period	T _h	1034	1060	2047	1clk	Active	T _{disp(h)}	960	960	960	1clk	Blanking	T _{bp(h)} +T _{fp(h)} +FW _{hs}	74	100	1087	1clk	Clock	Period	T _{clk}	25	13.3	11.1	ns	Frequency	F _{req}	40	75	94	MHz	Frame rate	Frame rate	F _r	50	60	75	Hz	6.4 Timing Characteristics: The input signal timing specifications are shown as the following table: <table border="1"> <thead> <tr> <th>Signal</th><th>Item</th><th>Symbol</th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr> </thead> <tbody> <tr> <td rowspan="3">Vertical Section</td><td>Period</td><td>T_v</td><td>1082</td><td>1135</td><td>1818</td><td>1h</td></tr> <tr> <td>Active</td><td>T_{disp(v)}</td><td>1080</td><td>1080</td><td>1080</td><td>1h</td></tr> <tr> <td>Blanking</td><td>T_{bp(v)}+T_{fp(v)}+FW_{vs}</td><td>12</td><td>60</td><td>738</td><td>1h</td></tr> <tr> <td rowspan="3">Horizontal Section</td><td>Period</td><td>T_h</td><td>1034</td><td>1050</td><td>1100</td><td>1clk</td></tr> <tr> <td>Active</td><td>T_{disp(h)}</td><td>960</td><td>960</td><td>960</td><td>1clk</td></tr> <tr> <td>Blanking</td><td>T_{bp(h)}+T_{fp(h)}+FW_{hs}</td><td>74</td><td>90</td><td>140</td><td>1clk</td></tr> <tr> <td rowspan="2">Clock</td><td>Period</td><td>T_{clk}</td><td>10.8</td><td>14.0</td><td>17.7</td><td>ns</td></tr> <tr> <td>Frequency</td><td>F_{req}</td><td>66.5</td><td>71.2</td><td>94.0</td><td>MHz</td></tr> <tr> <td rowspan="2">Frame rate</td><td>Frame rate</td><td>F_r</td><td>60</td><td>60</td><td>76</td><td>Hz</td></tr> <tr> <td>Frame Frequency</td><td>F_{freq}</td><td>60</td><td>60</td><td>91</td><td>KHz</td></tr> </tbody> </table>	Signal	Item	Symbol	Min	Typ	Max	Unit	Vertical Section	Period	T _v	1082	1135	1818	1h	Active	T _{disp(v)}	1080	1080	1080	1h	Blanking	T _{bp(v)} +T _{fp(v)} +FW _{vs}	12	60	738	1h	Horizontal Section	Period	T _h	1034	1050	1100	1clk	Active	T _{disp(h)}	960	960	960	1clk	Blanking	T _{bp(h)} +T _{fp(h)} +FW _{hs}	74	90	140	1clk	Clock	Period	T _{clk}	10.8	14.0	17.7	ns	Frequency	F _{req}	66.5	71.2	94.0	MHz	Frame rate	Frame rate	F _r	60	60	76	Hz	Frame Frequency	F _{freq}	60	60	91	KHz
Signal	Item	Symbol	Min	Typ	Max	Unit																																																																																																																																				
Vertical Section	Period	T _v	1080	1120	2047	1h																																																																																																																																				
	Active	T _{disp(v)}	1080	1080	1080	1h																																																																																																																																				
	Blanking	T _{bp(v)} +T _{fp(v)} +FW _{vs}	8	40	967	1h																																																																																																																																				
Horizontal Section	Period	T _h	1034	1060	2047	1clk																																																																																																																																				
	Active	T _{disp(h)}	960	960	960	1clk																																																																																																																																				
	Blanking	T _{bp(h)} +T _{fp(h)} +FW _{hs}	74	100	1087	1clk																																																																																																																																				
Clock	Period	T _{clk}	25	13.3	11.1	ns																																																																																																																																				
	Frequency	F _{req}	40	75	94	MHz																																																																																																																																				
Frame rate	Frame rate	F _r	50	60	75	Hz																																																																																																																																				
Signal	Item	Symbol	Min	Typ	Max	Unit																																																																																																																																				
Vertical Section	Period	T _v	1082	1135	1818	1h																																																																																																																																				
	Active	T _{disp(v)}	1080	1080	1080	1h																																																																																																																																				
	Blanking	T _{bp(v)} +T _{fp(v)} +FW _{vs}	12	60	738	1h																																																																																																																																				
Horizontal Section	Period	T _h	1034	1050	1100	1clk																																																																																																																																				
	Active	T _{disp(h)}	960	960	960	1clk																																																																																																																																				
	Blanking	T _{bp(h)} +T _{fp(h)} +FW _{hs}	74	90	140	1clk																																																																																																																																				
Clock	Period	T _{clk}	10.8	14.0	17.7	ns																																																																																																																																				
	Frequency	F _{req}	66.5	71.2	94.0	MHz																																																																																																																																				
Frame rate	Frame rate	F _r	60	60	76	Hz																																																																																																																																				
	Frame Frequency	F _{freq}	60	60	91	KHz																																																																																																																																				



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

1 Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of LED light bar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the TFT Module may be damaged.
- 10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 13) Avoid touching COF position while doing mechanical design.
- 14) While storing modules as spares for a long time, the following precautions are necessary:
 - Store modules in a dark place. Do not expose them to sunlight or fluorescent light.
 - Keep the temperature between 5°C and 35°C at normal humidity.
- 15) Pls avoid touching COF position while you are doing mechanical design.
- 16) When storing modules as spares for a long time, the following precaution is necessary: Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

2 General Description

This specification applies to the 21.5 inch-FHD color a-Si TFT-LCD Module M215HTN01.0. The display supports the FHD - 1920(H) x 1080(V) screen format and 16.7M colors (RGB 6-bit data). The light source of this TFT-LCD module is W-LED. All input signals are 2-channel LVDS interface and this module doesn't contain a driver for backlight.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25°C condition:

Items	Unit	Specification
Screen Diagonal	[mm]	546.86 (21.53")
Active Area	[mm]	476.64 (H) x 268.11 (V)
Pixels H x V		1920(x3) x 1080
Pixel Pitch	[um]	248.25 (per one triad) ×248.25
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN Mode, Normally White
White Luminance (Center)	[cd/m ²]	200 cd/m ² (Typ.)
Contrast Ratio		600 (Typ.)
Optical Response Time	[msec]	5ms (Typ., on/off)
Nominal Input Voltage VDD	[Volt]	+5.0 V (Type)
Power Consumption (VDD line + LED line)	[Watt]	13.6W VDD line : PDD (typ), All black pattern at 60Hz = 4.1W LED line : PBLU (typ) = 9.5W
Weight	[Grams]	1850 (Typ.)
Physical Size	[mm]	495.6(H) × 292.2(V) × 10.3(D)
Electrical Interface		Dual channel LVDS
Support Color		16.7M colors (RGB 6-bit + Hi_FRC)
Surface Treatment		Anti-Glare, 3H
Temperature Range		
Operating	[°C]	0 to +50
Storage (Shipping)	[°C]	-20 to +60
RoHS Compliance		RoHS Compliance



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C:

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal (Right)	40	45	-	2
		CR = 10 (Left)	40	45	-	
		Vertical (Up)	15	20	-	
		CR = 10 (Down)	40	45	-	
Contrast ratio		Normal Direction	360	600	-	3
Response Time	[msec]	Raising Time (T _{RR})	-	3.8	5.5	4
		Falling Time (T _{RF})	-	1.2	2.5	
		Raising + Falling	-	5	8	
		Gray to Gray(16x16 avg.)				
Color / Chromaticity Coordinates (CIE)		Red x	0.610	0.640	0.670	5
		Red y	0.300	0.330	0.360	
		Green x	0.302	0.332	0.362	
		Green y	0.595	0.625	0.655	
		Blue x	0.126	0.156	0.186	
		Blue y	0.019	0.049	0.079	
Color Coordinates (CIE) White		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Central Luminance	[cd/m ²]		160	200	-	6
Luminance Uniformity	[%]		75	80	-	7
Crosstalk (in 60Hz)	[%]				1.5	8
Flicker	dB				-20	9



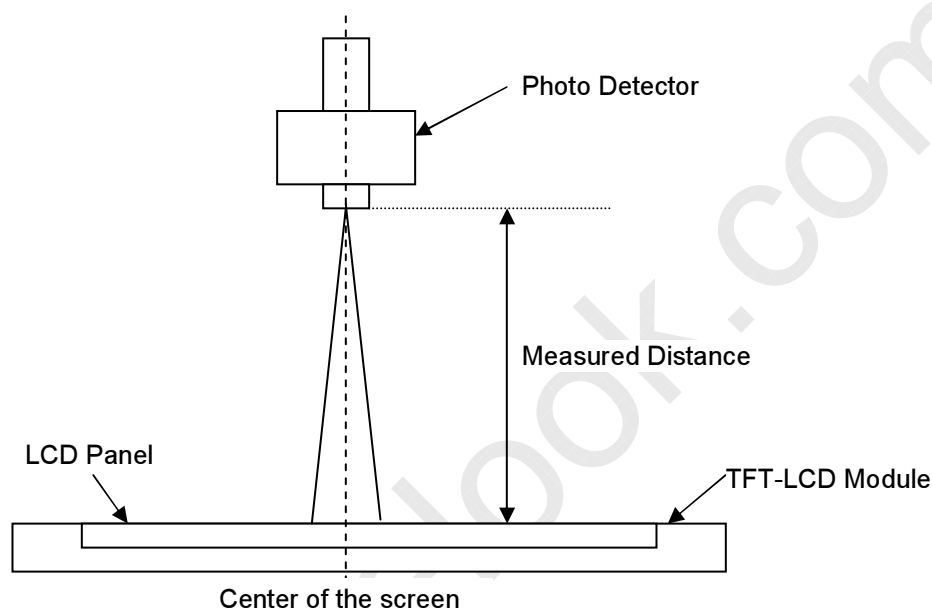
Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

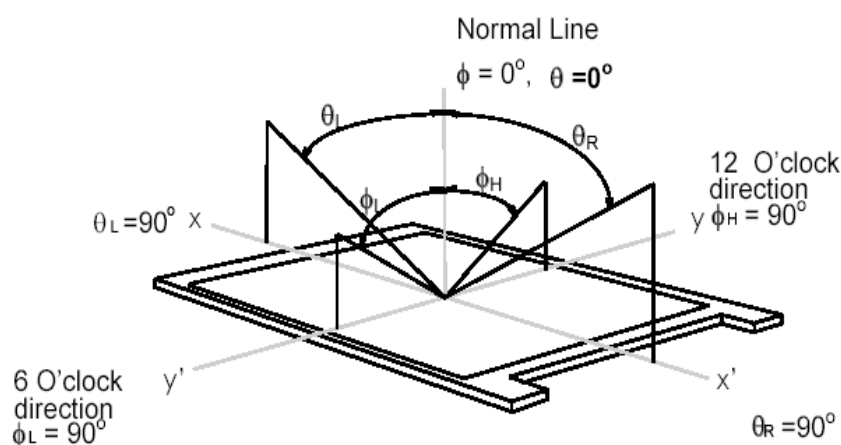
Note 1: Measurement Method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35°C). In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.



Note 2: Definition of Viewing Angle measured by ELDIM (EZContrast 88)

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.





Product Specification

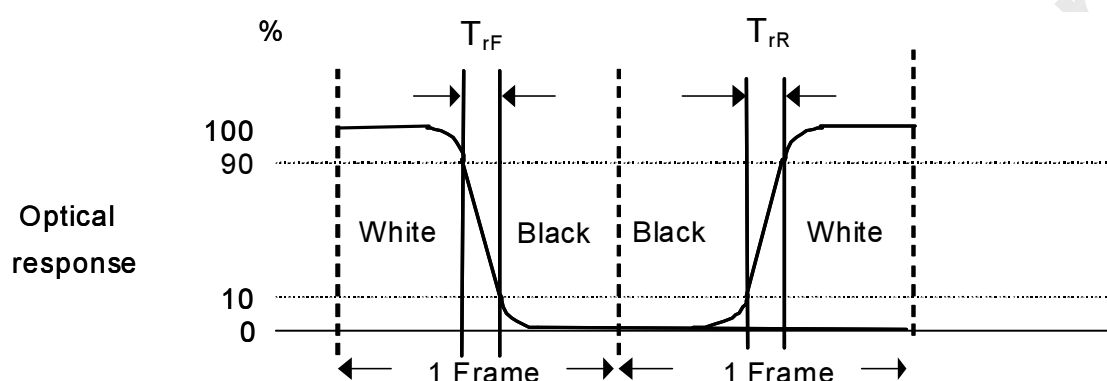
M215HTN01.0

AU OPTRONICS CORPORATION

Note 3: Contrast Ratio measured by TOPCON SR-3

Note 4: Definition of Response time measured by Westar TRD-100A

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time, T_{rR}), and from "Full White" to "Full Black" (falling time, T_{rF}), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.



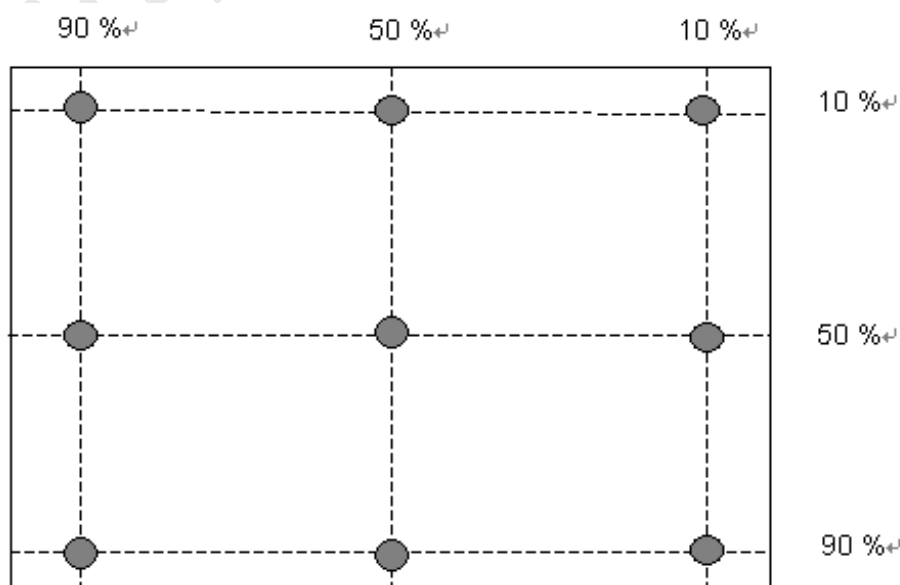
$T_{rR} + T_{rF} = 5 \text{ msec (typ.)}$.

Algorithm: $|\text{Gray Level A} - \text{Gray Level B}| \geq 16$, then the average gray to gray response time is 2 ms, ($F = 60 \text{ Hz}$).

Note 5: Color Chromaticity and Coordinates (CIE) measured by TOPCON SR-3

Note 6: Central Luminance measured by TOPCON SR-3

Note 7: Luminance Uniformity of these 9 points defined as below and measured by TOPCON SR-3





Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1-9)}}{\text{Maximum Luminance in 9 Points (1-9)}}$$

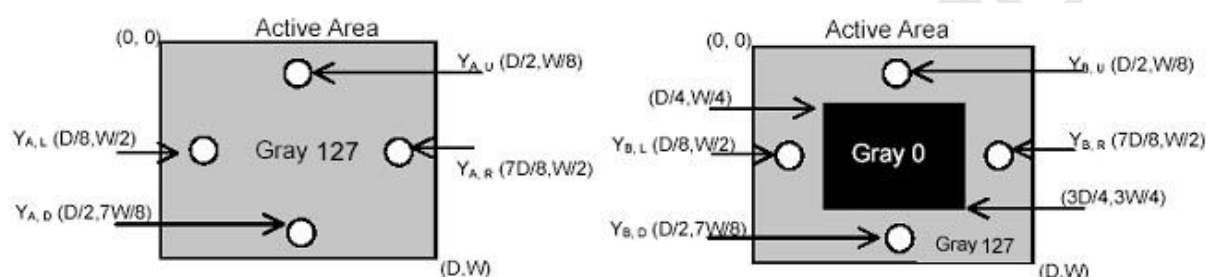
Note 8: Crosstalk defined as below and measured by TOPCON SR-3

$$CT = | YB - YA | / YA \times 100 (\%)$$

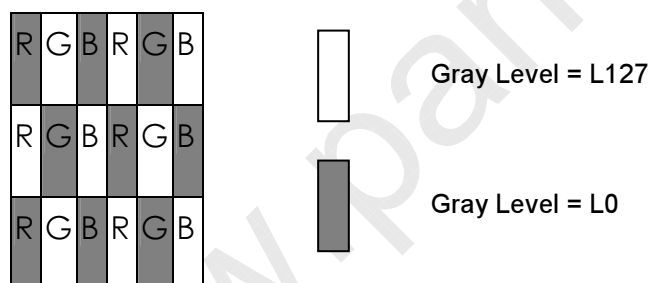
Where

YA = Luminance of measured location without gray level 0 pattern (cd/m²)

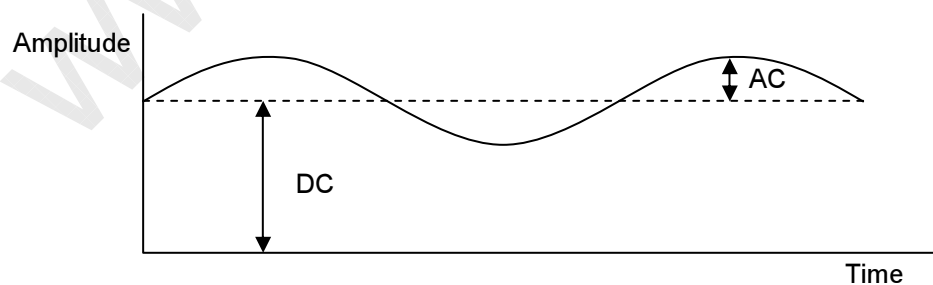
YB = Luminance of measured location with gray level 0 pattern (cd/m²)



Note 9: Test Pattern Sub-checker Pattern measured by TOPCON SR-3



Method: Record dBV & DC value with TRD-100



$$\text{Flicker (dB)} = 20 \log \frac{\text{AC Level(at 30 Hz)}}{\text{DC Level}}$$



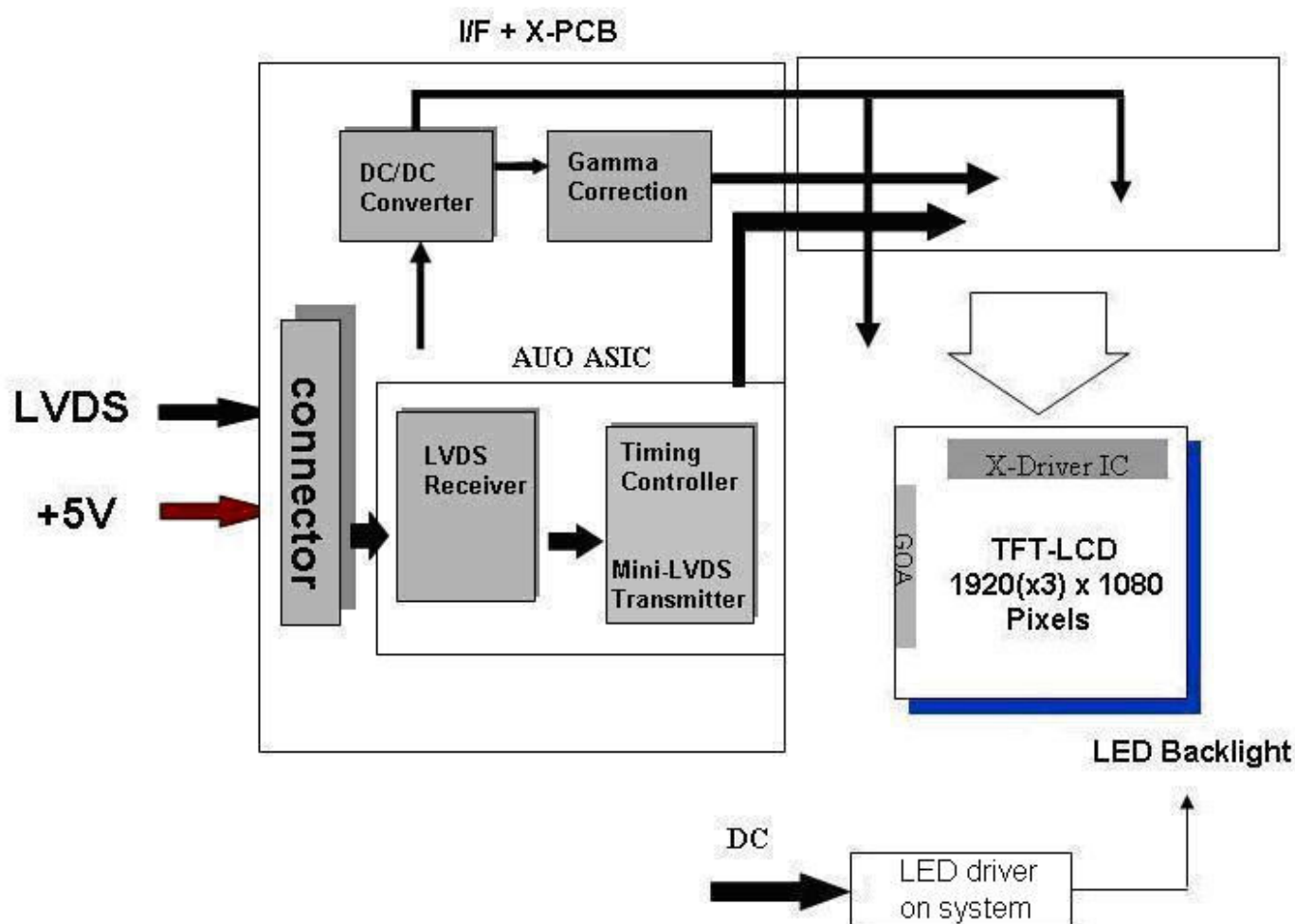
Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

3 Functional Block Diagram

The following diagram shows the functional block of the 21.5 inch Color TFT-LCD Module:



I/F PCB Interface:

FI-XPB30SRLA-HF11 (JAE)

01-187145-30091-3(A) (P-TWO)

Mating Type:

FI-X30HL (Locked Type)



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

4 Absolute Maximum Ratings

Absolute maximum ratings of the module are listed as follows:

4.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive	VDD	0	6	[Volt]	Note 1,2

4.2 Backlight Unit

Item	Symbol	Min	Max	Unit	Conditions
LED Forward Current	IRLED1	0	90	[mA]	Note 1,2,5 100% duty
	IRLED2				
	IRLED3				
	IRLED4				
LED Pulse Forward Current	IPLED1	-	150	[mA]	Note 1,2,5 10% duty @100Hz
	IPLED2				
	IPLED3				
	IPLED4				
LED forward Voltage variation (per string variation)	ΔV_f	3.0	3.6	[Volt]	Note 1,2

4.3 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	+50	[°C]	Note 3
Glass surface temperature (operation)	TGS	0	+65	[°C]	Note3 Note4
Operation Humidity	HOP	5	90	[%RH]	Note 3
Storage Temperature	TST	-20	+60	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: With in Ta (25°C)

Note 2: Permanent damage to the device may occur if exceeding maximum values

Note 3: Temperature and relative humidity range are shown as the below figure.

1. 90% RH Max (Ta ≤ 39°C)
2. Max wet-bulb temperature at 39°C or less. (Ta ≤ 39°C)
3. No condensation

Note 4: Function Judged only

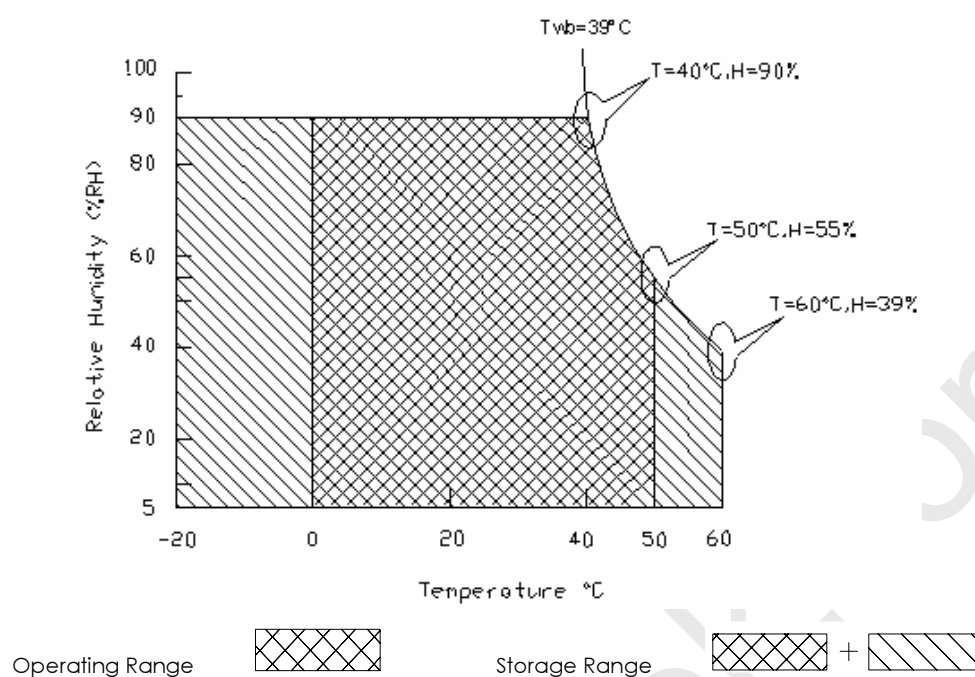
Note 5: IRLED1,2,3,4 and IPLED1,2,3,4 define as per strings LED current.



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION





Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

5 Electrical Characteristics

5.1 TFT LCD Module

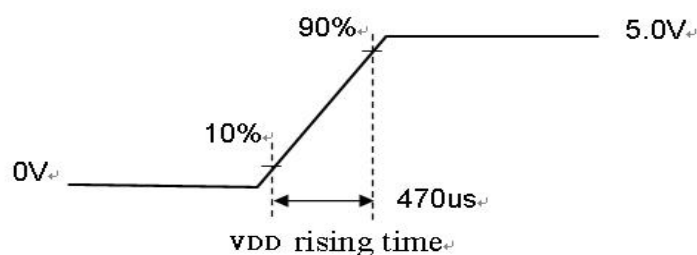
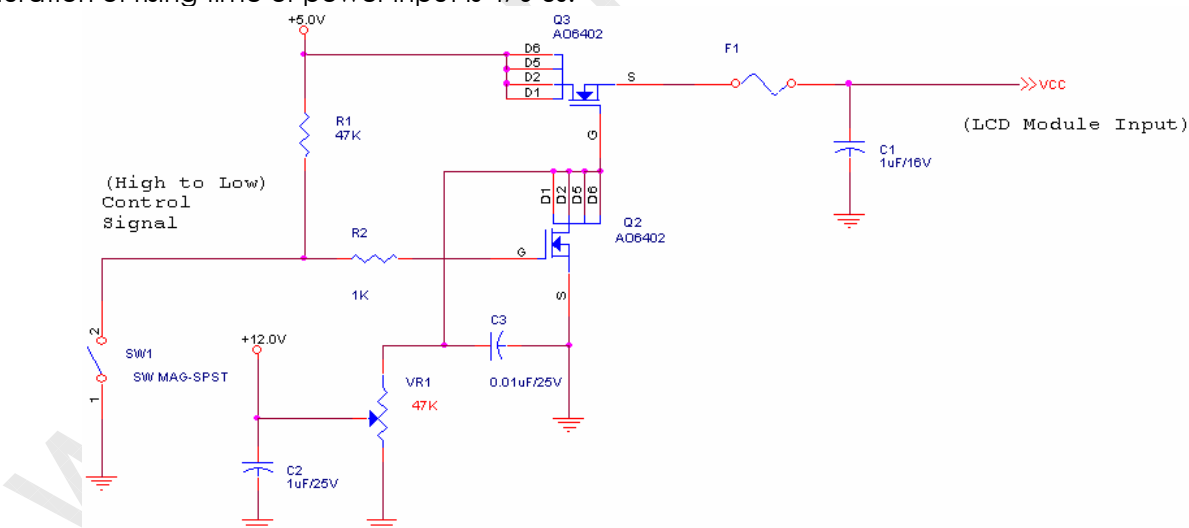
5.1.1 Power Specification

Input power specifications are listed as follows:

Symbol	Description	Min	Typ.	Max	Unit	Conditions
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	+/-10%
IDD1	Input Current	-	0.82	0.98	[A]	VDD= 5.0V, All Black Pattern At 60Hz
			0.92	1.1	[A]	VDD= 5.0V, All Black Pattern At 75Hz
PDD1	VDD Power	-	4.1	4.9	[Watt]	VDD= 5.0V, All Black Pattern At 60Hz
			4.6	5.5	[Watt]	VDD= 5.0V, All Black Pattern At 75Hz
IRush	Inrush Current	-	-	3	[A]	Note 1
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	500	[mV] p-p	VDD= 5.0V, All Black Pattern At 75Hz

Note 1: Measurement Conditions:

The duration of rising time of power input is 470 us.





Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

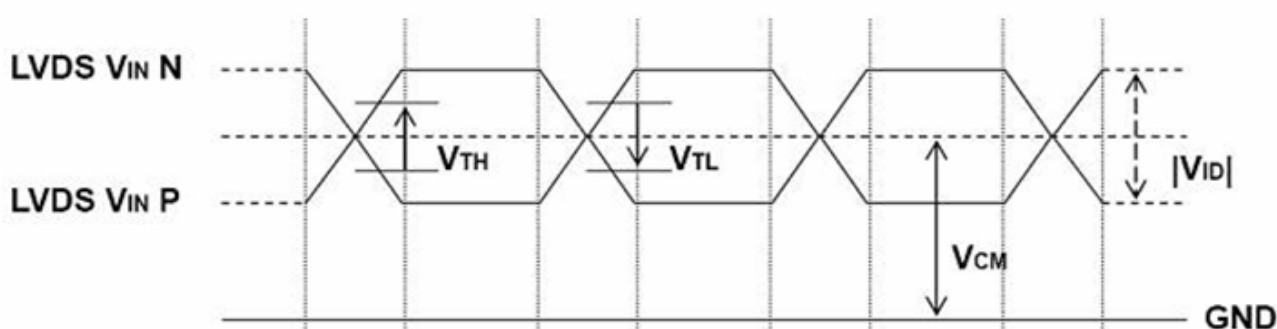
5.1.2 Signal Electrical Characteristics

(1) DC Characteristics of each signal are as following:

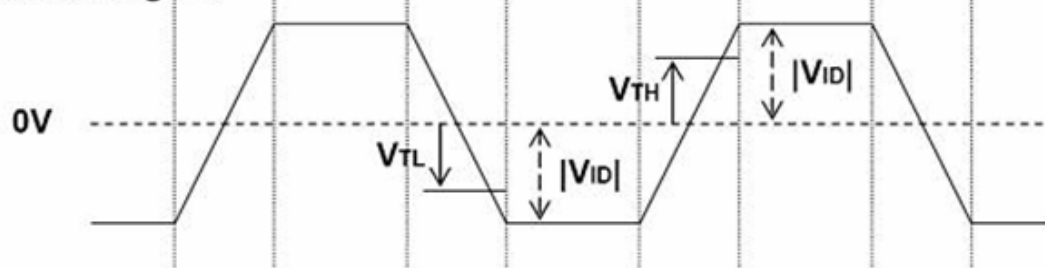
Symbol	Description	Min	Typ	Max	Units	Conditions
V_{TH}	Differential Input High Threshold	-	-	+100	[mV]	$V_{CM} = 1.2V$ Note 1
V_{TL}	Differential Input Low Threshold	-100	-	-	[mV]	$V_{CM} = 1.2V$ Note 1
$ V_{ID} $	Input Differential Voltage	100	-	600	[mV]	Note 1
V_{CM}	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	$V_{TH}-V_{TL} = 200mV$ (max) Note 1

Note 1: LVDS Signal Waveform

Single-End



Differential Signal





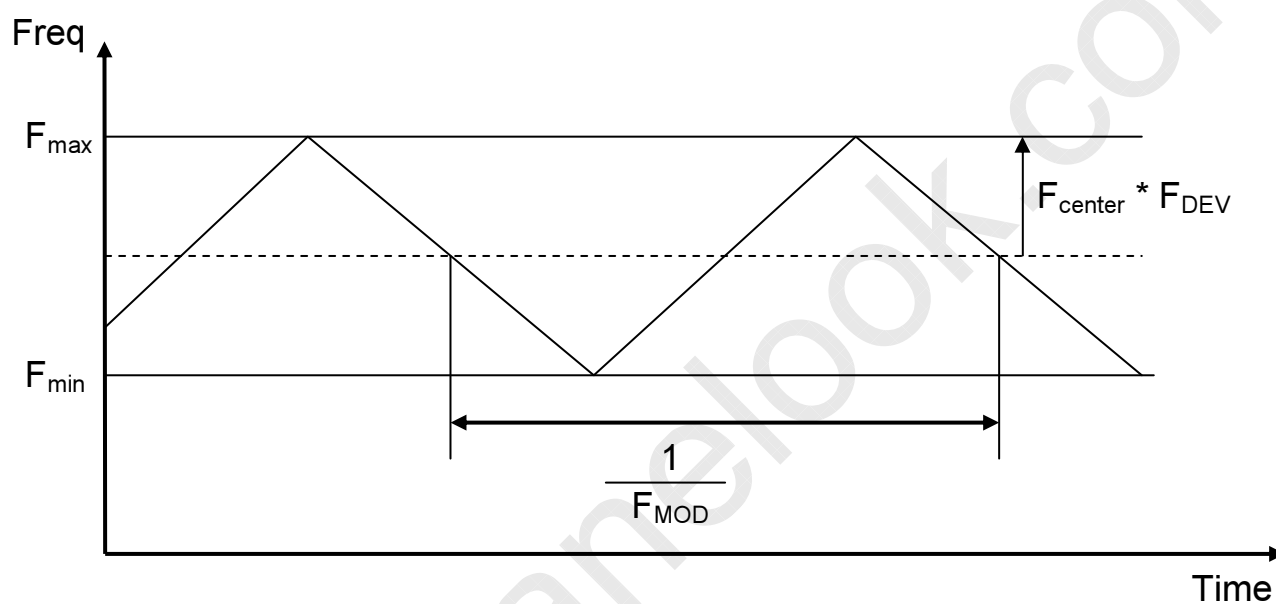
Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

(2) AC Characteristics

Symbol	Description	Min	Max	Units	Conditions
F_{DEV}	Maximum deviation of input clock frequency during SSC	-	± 3	%	
F_{MOD}	Maximum modulation frequency of input clock during SSC	-	200	KHz	



< Spread Spectrum >



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

5.2 Backlight Unit

Parameter guideline for LED driving is under stable conditions at 25 °C (Room Temperature):

Symbol	Description	Min.□	Typ.	Max.	Unit	Note
IRLED1	LED Forward Current	-	60	63	[mA]	Note 1
IRLED2						
IRLED3						
IRLED4						
VLED	Light Bar Operation Voltage (for reference)	34.5	39.6	43.2	[Volt]	Note 2
PBLU	BLU Power Consumption (for reference)	8.28	9.5	10.37	[Watt]	Note 3
LTLED	LED Life Time (Typical)	30,000	-	-	[Hour]	Note 4

Each module consists of 48 pcs LED (4 strings x 12 pcs / string)

Note 1: The specified current is 100% duty of LED chip input current, IRLED1,2,3,4 define as per strings LED current.

Note 2: The value showed is one string operation voltage.

Note 3: $PBLU = VLED * (IRLED1 + IRLED2 + IRLED3 + IRLED4)$

Note 4: Definition of life time: Brightness becomes to 50% of its original value. The minimum life time of LED unit is on the condition of IRLED = 60mA and 25±2°C (Room Temperature).



Product Specification

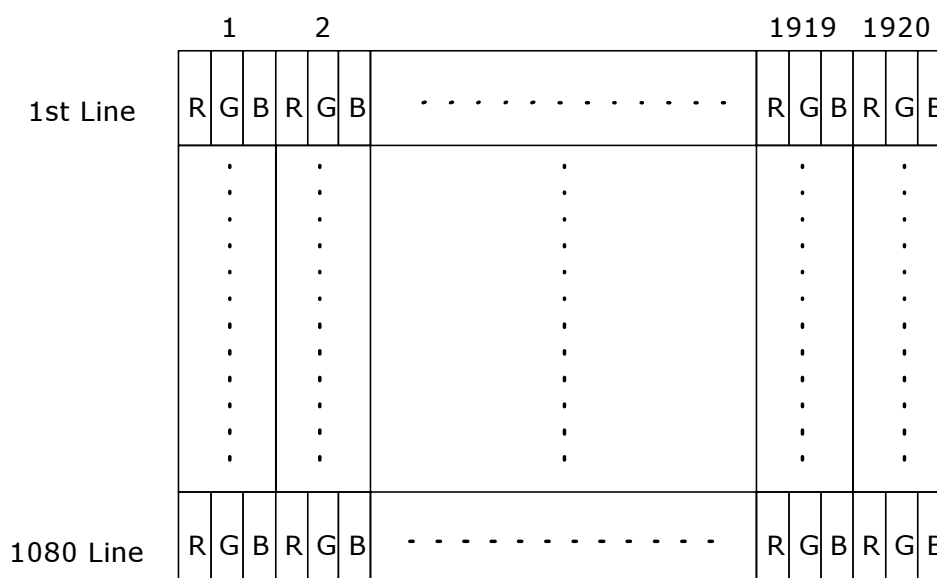
M215HTN01.0

AU OPTRONICS CORPORATION

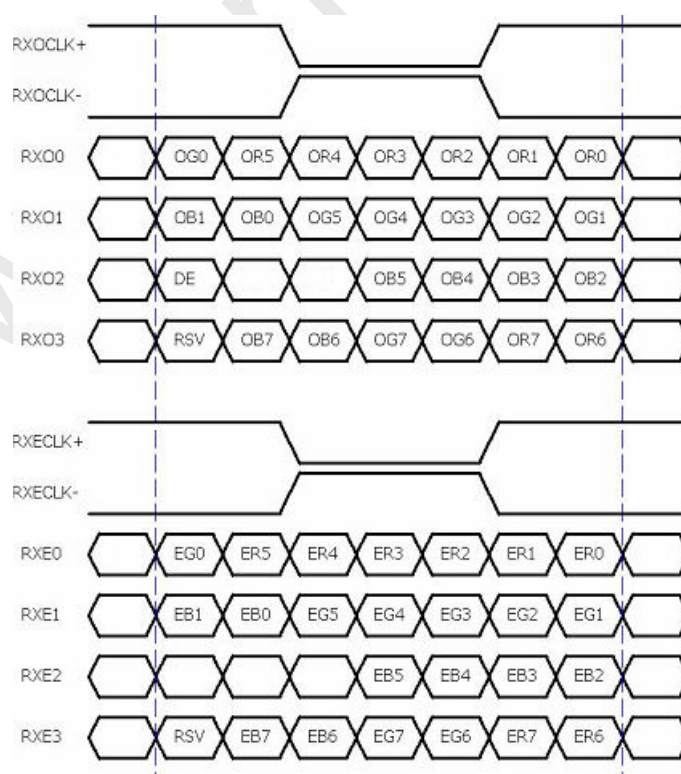
6 Signal Characteristics

6.1 Pixel Format Definition

Following figure shows the relationship between the input signals and LCD pixel format.



6.2 Input Data Format Definition



Note 1: R/G/B data 7:MSB, R/G/B data 0:LSB O = "Odd Pixel Data" E = "Even Pixel Data"



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

6.3 Signal Description

PIN #	SIGNAL NAME	DESCRIPTION
1	RxOIN0-	Negative LVDS differential data input (Odd data)
2	RxOIN0+	Positive LVDS differential data input (Odd data)
3	RxOIN1-	Negative LVDS differential data input (Odd data)
4	RxOIN1+	Positive LVDS differential data input (Odd data)
5	RxOIN2-	Negative LVDS differential data input (Odd data, DSPTMG)
6	RxOIN2+	Positive LVDS differential data input (Odd data, DSPTMG)
7	GND	Power Ground
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)
10	RxOIN3-	Negative LVDS differential data input (Odd data)
11	RxOIN3+	Positive LVDS differential data input (Odd data)
12	RxEIN0-	Negative LVDS differential data input (Even data)
13	RxEIN0+	LVDS differential data input (Even data)
14	GND	Power Ground
15	RxEIN1-	Negative LVDS differential data input (Even data)
16	RxEIN1+	Positive LVDS differential data input (Even data)
17	GND	Power Ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	Positive LVDS differential data input (Even data)
20	RxECLK-	Negative LVDS differential clock input (Even clock)
21	RxECLK+	Positive LVDS differential clock input (Even clock)
22	RxEIN3-	Negative LVDS differential data input (Even data)
23	RxEIN3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No connection (for AUO test only. Do not connect)
26	NC	No connection (for AUO test only. Do not connect)
27	NC	No connection (for AUO test only. Do not connect)
28	VDD	Power +5V
29	VDD	Power +5V
30	VDD	Power +5V

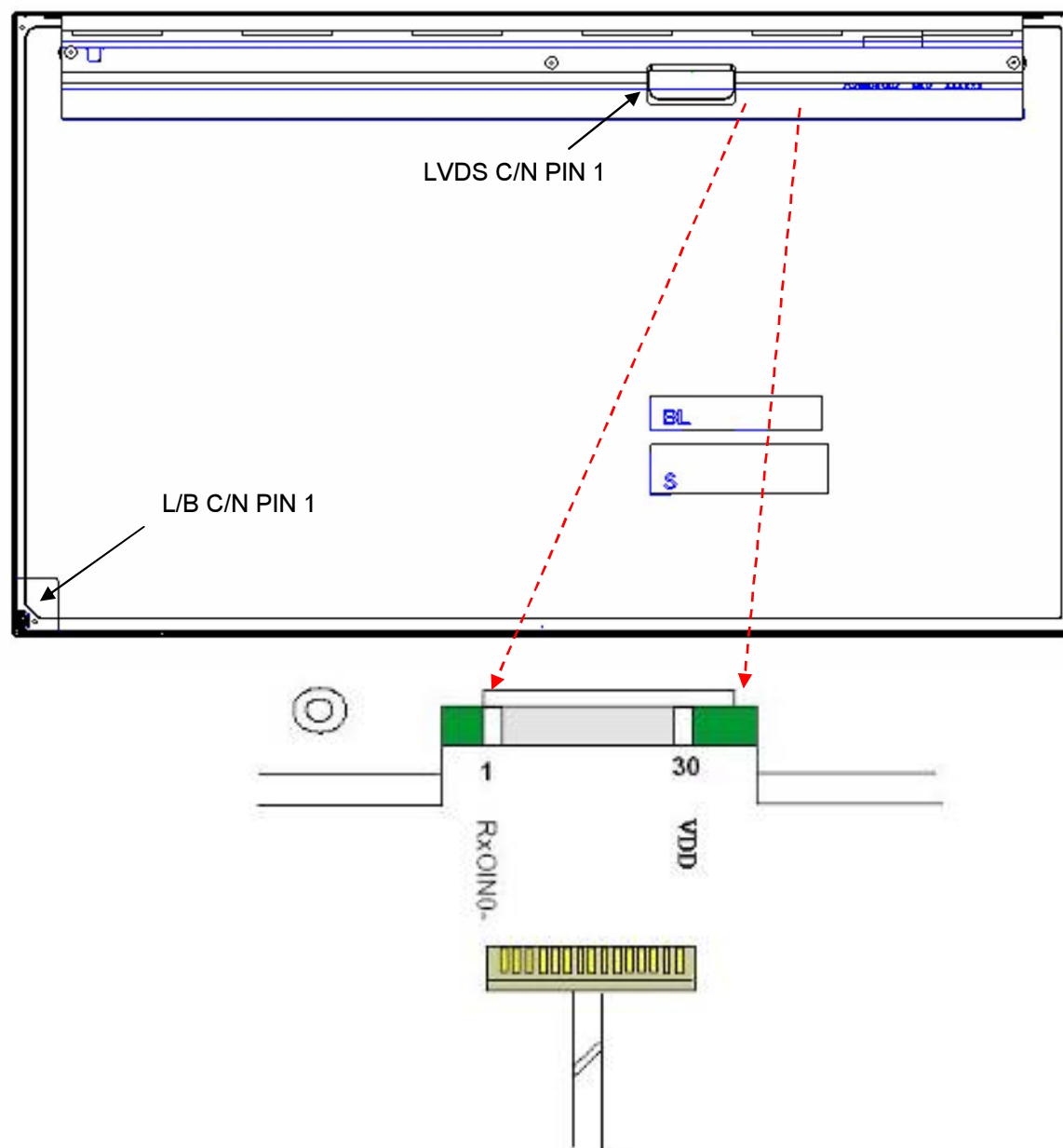
Note 1: Input signals of odd and even clock shall be the same timing.



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION





Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

6.4 Timing Characteristics

The input signal timing specifications are shown as the following table

Signal	Item	Symbol	Min	Typ	Max	Unit
Vertical Section	Period	Tv	1092	1130	1818	Th
	Active	Tdisp(v)	1080	1080	1080	Th
	Blanking	Tbp(v)+Tfp(v)+PWvs	12	50	738	Th
Horizontal Section	Period	Th	1034	1050	1100	Tclk
	Active	Tdisp(h)	960	960	960	Tclk
	Blanking	Tbp(h)+Tfp(h)+PWhs	74	90	140	Tclk
Clock	Period	Tclk	10.6	14.0	17.7	ns
	Frequency	Freq	56.5	71.2	94.0	MHz
Frame rate	Frame rate	F	50	60	76	Hz
Hsync Frequency	Hsync Frequency	HFreq	55	68	91	KHz

Note 1: DE mode only

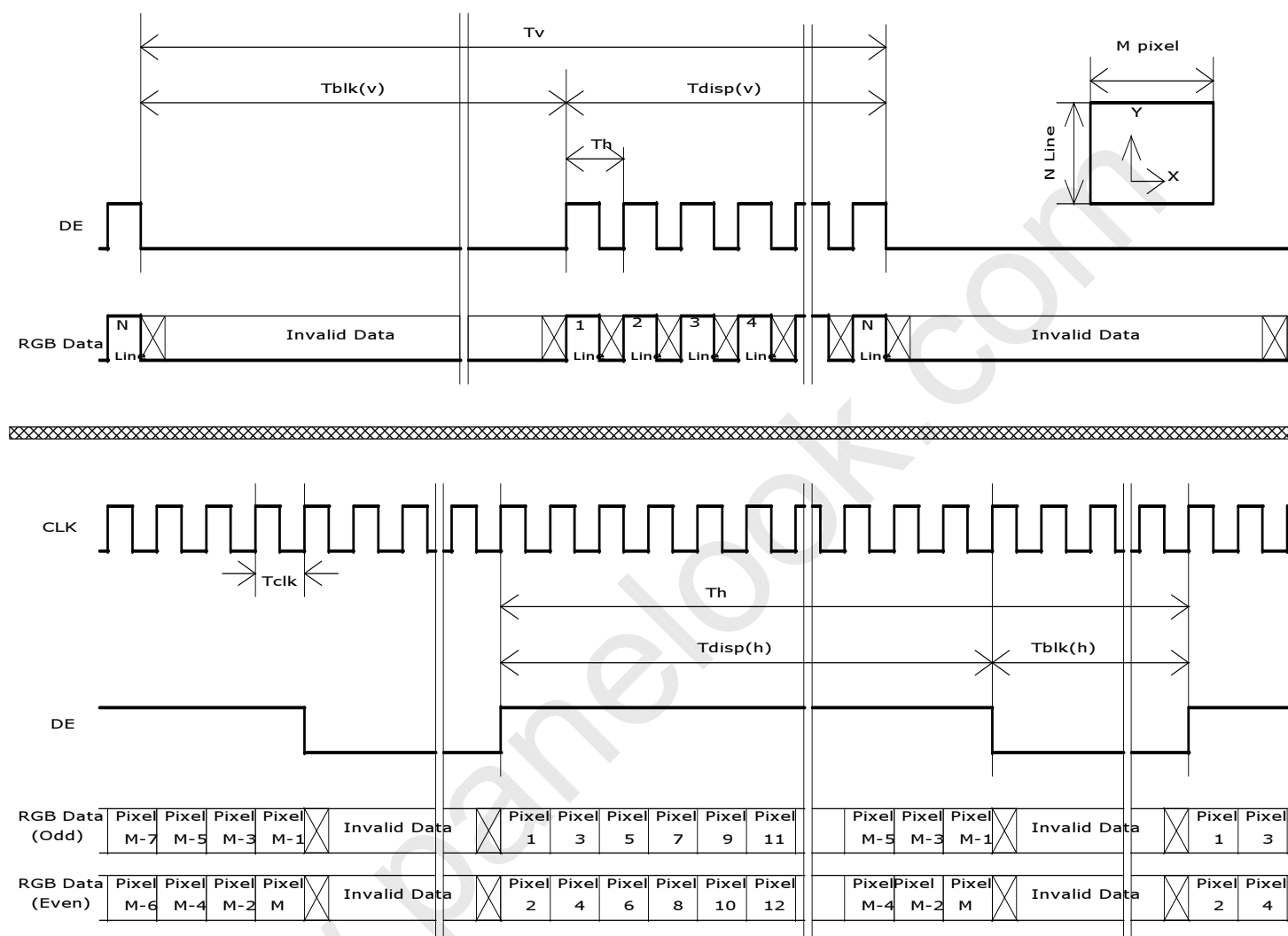


Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

6.5 Timing Diagram





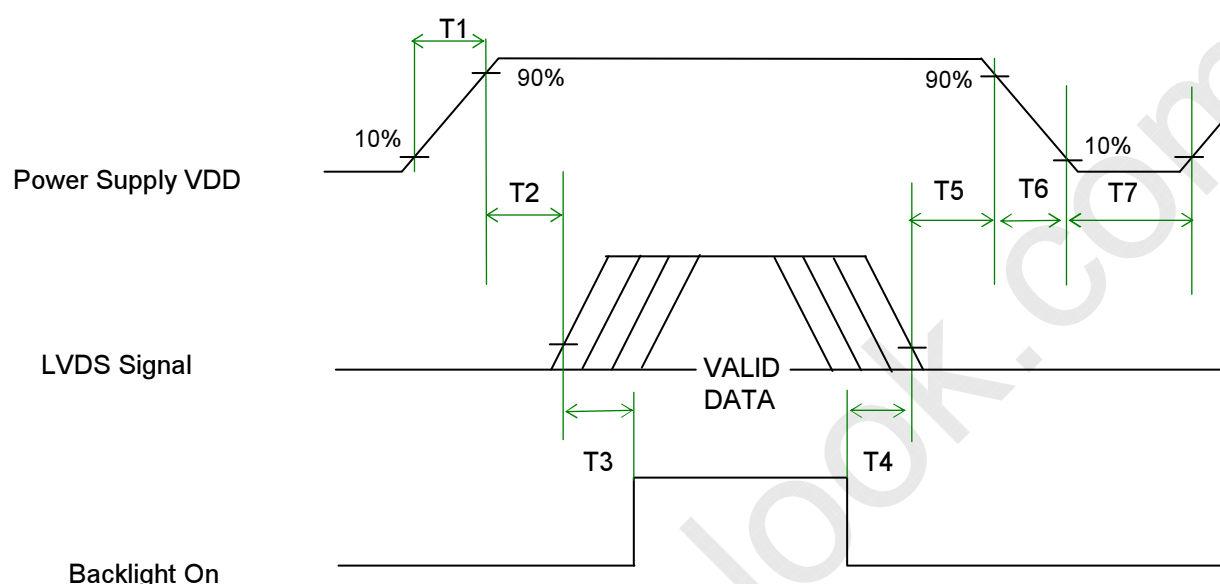
Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

6.6 Power ON/OFF Sequence

VDD power and lamp on/off sequence are as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state when VDD is off.



Power Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	0	-	50	[ms]
T3	500	-	-	[ms]
T4	100	-	-	[ms]
T5	0	-	50	[ms] Note 1,2
T6	5	-	100	[ms] Note 1,2
T7	1000	-	-	[ms]

Note1 : Recommend setting T5 = 0ms to avoid electronic noise when VDD is off.

Note2 : During T5 and T6 period , please keep the level of input LVDS signals with Hi-Z state.



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

7 Connector and Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name / Designation	Interface Connector / Interface Card
Manufacturer	JAE P-TWO
Type Part Number	FI-XPB30SRLA-HF11 01-187145-30091-3(A)
Mating Housing Part Number	FI-X30HL (Locked Type)

7.1.1 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	GND	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	GND
15	RxEIN1-	16	RxEIN1+
17	GND	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	GND
25	NC (for AUO test only. Do not connect)	26	NC (for AUO test only. Do not connect)
27	NC (for AUO test only. Do not connect)	28	VDD
29	VDD	30	VDD



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

7.2 LED Connector on Backlight Unit

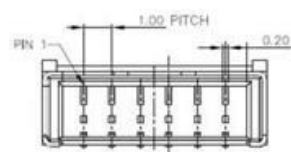
This connector is mounted on LED light bar.

Connector Name / Designation	Light Bar Connector
Manufacturer	CVILUX
Type Part Number	CI1406M1HRB-NH
Mating Housing Part Number	

7.2.1 LED Pin assignment

Pin#	Signal Name
1	IRLED1 (current out)
2	IRLED2 (current out)
3	VLED (voltage in)
4	VLED (voltage in)
5	IRLED3 (current out)
6	IRLED4 (current out)

Rear view of panel



LB CN PIN1

LB connector



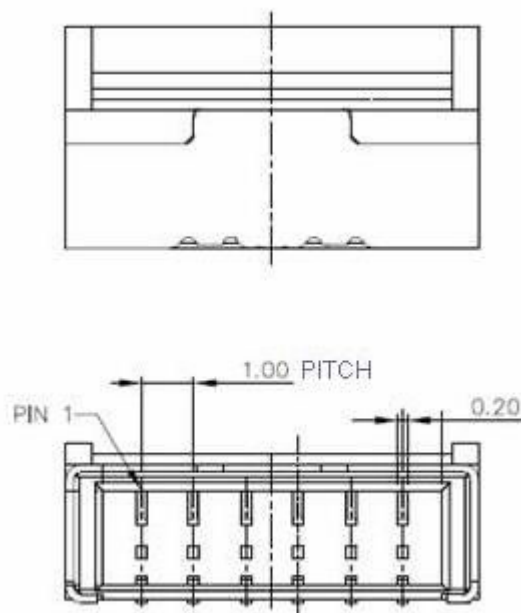


Product Specification

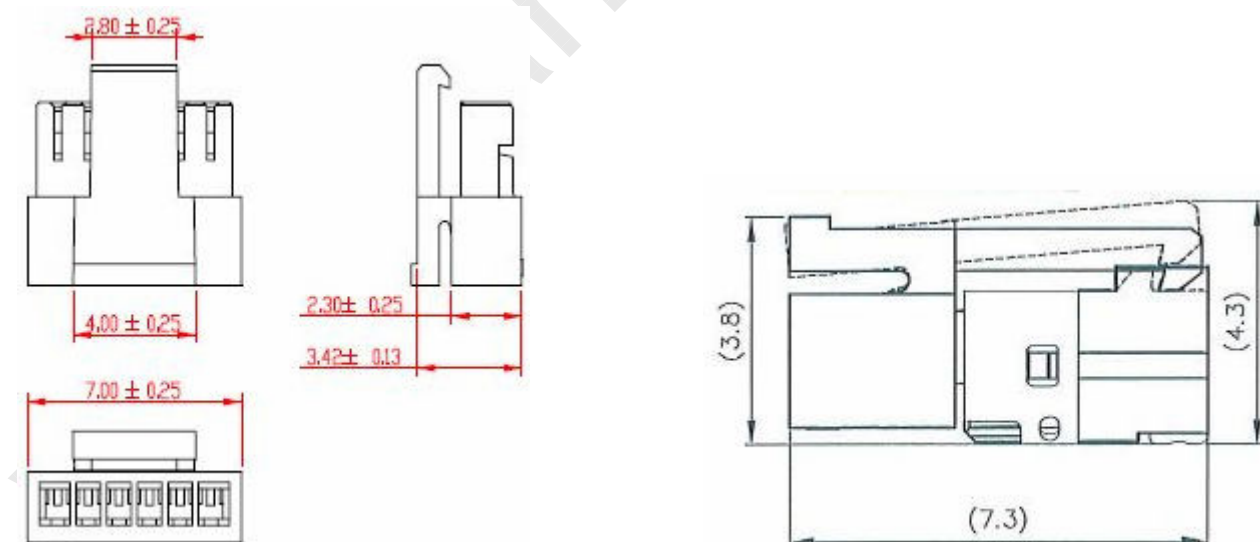
M215HTN01.0

AU OPTRONICS CORPORATION

7.2.2 LED Connector Dimension

 $H \times V \times D = 7.9 \times 3.05 \times 4.25$, Pitch = 1.0 (unit = mm)


7.2.3 LED Mating housing dimension





Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

8 Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 300 hours	
High Temperature Operation (HTO)	Ta= 50°C, 50%RH, 300 hours	
Low Temperature Operation (LTO)	Ta= 0°C, 300 hours	
High Temperature Storage (HTS)	Ta= 60°C, 300 hours	
Low Temperature Storage (LTS)	Ta= -20°C, 300 hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Duration: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: $\pm X$, $\pm Y$, $\pm Z$ (one time for each Axis)	
Drop Test	Height: 46 cm, package test	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 100 cycles	Note 1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: $\pm 15\text{KV}$, 150pF(330 Ω) 1sec, 11 points, 25 times/ point.	Note 2
	Air Discharge: $\pm 15\text{KV}$, 150pF(330 Ω) 1sec 11 points, 25 times/ point.	
Altitude Test	Operation: 18,000 ft Non-Operation: 40,000 ft	

Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2: EN61000-4-2, ESD class B: Certain performance degradation allowed:

- No data lost
- Self-recoverable
- No hardware failures



Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

www.panelook.com



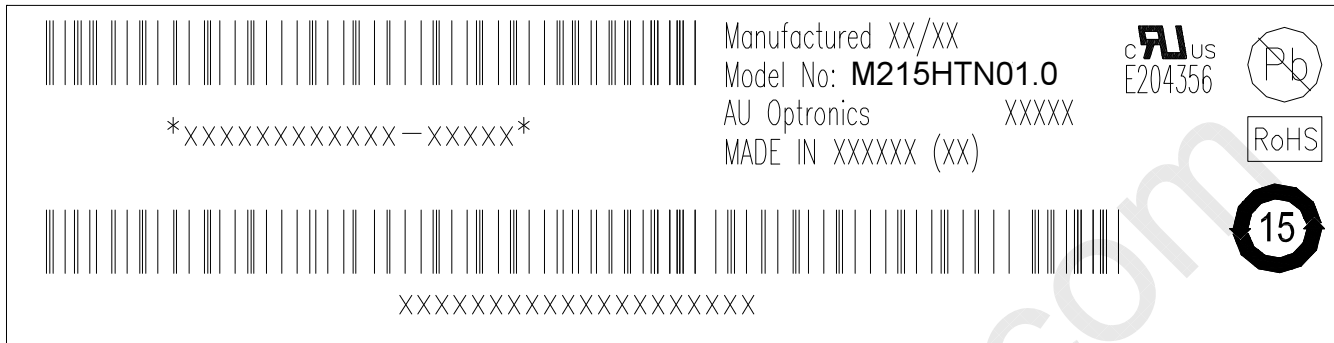
Product Specification

M215HTN01.0

AU OPTRONICS CORPORATION

9 Shipping Label

The label is on the panel as shown below:



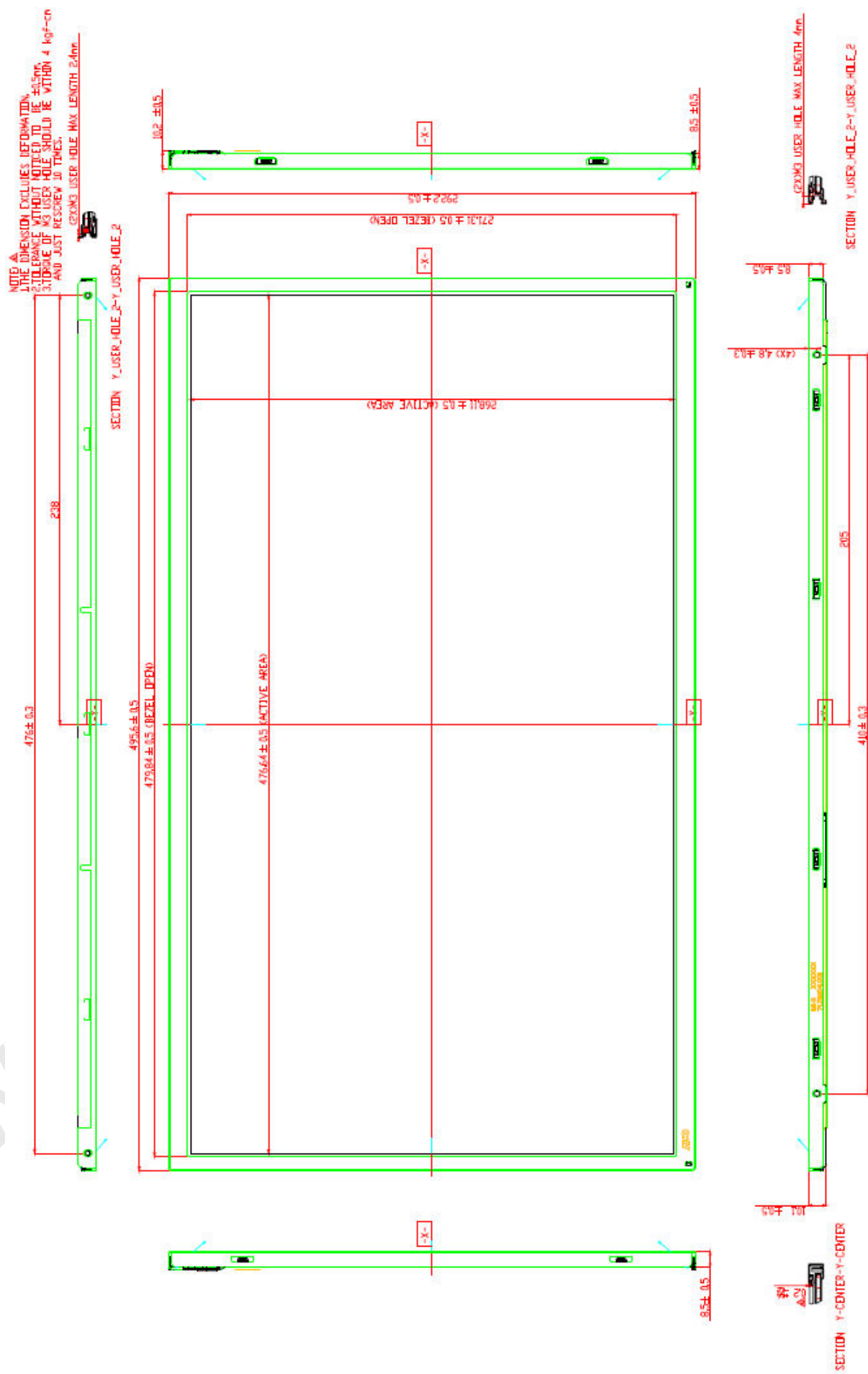
Note 1: For Pb Free products, AUO will add  for identification.

Note 2: For RoHS compatible products, AUO will add  for identification.

Note 3: For China RoHS compatible products, AUO will add  for identification.

Note 4: The Green Mark will be presented only when the green documents have been ready by AUO Internal Green Team.

10.0 Mechanical Characteristics

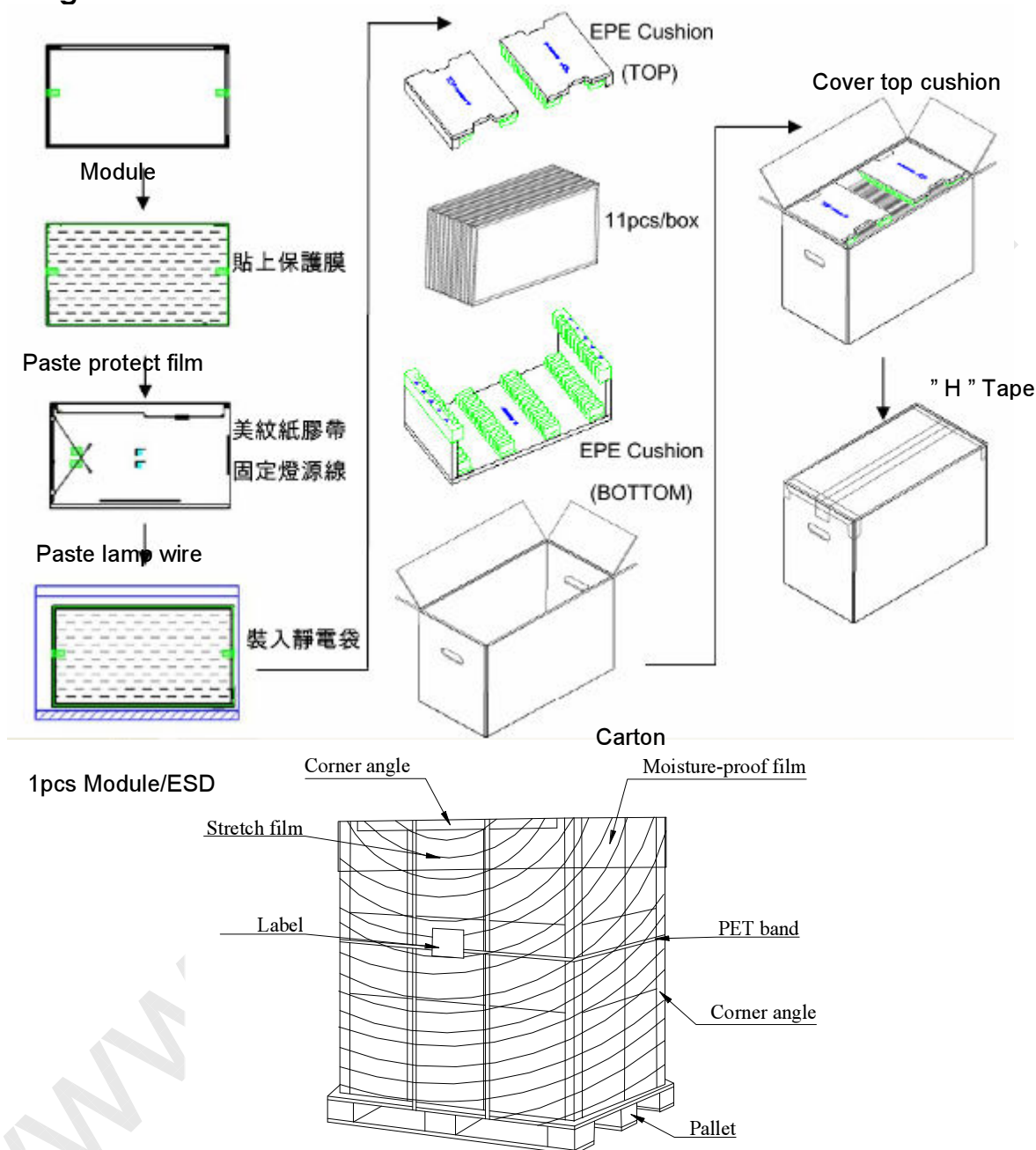






11. Packing Specification

11.1 Packing Flow





11.2. Pallet and shipment information

	Item	Specification			Remark
		Q'ty	Dimension	Weight(kg)	
1	Panel	1	495.6(W)mm × 292.2(H)mm × 11(D)mm	1.92	Note1
2	Cushion	1	-	0.40	
3	Box	1	556(L)mm x 292(W)mm x 375(H)mm	0.95	without Panel & cushion Note1
4	Packing Box	11 pcs/Box	556(L)mm x 292(W)mm x 375(H)mm	23.00	with panel & cushion Note1
5	Pallet	1	1150(L)mm x 910(W)mm x 132(H)mm	12.00	Note1
6	Pallet after Packing	18 boxes/pallet	1150(L)mm x 910(W)mm x 1257(H)mm	426.00	Note1

Note 1: Estimated value which is subject to change based on real measured data.